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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/492,243	01/27/2000	Yuesong He	M-7469-US	9620

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EXAMINER

ORTIZ, EDGARDO

ART UNIT PAPER NUMBER

2815

DATE MAILED: 11/13/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.
09/492,243

Applicant(s)
He Et.al.

Examiner
Edgardo Ortiz

Art Unit
2815



-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Aug 26, 2002
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 3, 4, 9, and 12-14 is/are pending in the application.
- 4a) Of the above, claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 3, 4, 9, and 12-14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____ | 6) <input type="checkbox"/> Other: |

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DETAILED ACTION

This Office Action is response to an amendment filed August 26, 2002 on which Applicant amended claim 4.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3, 4, 9, 12, 13 and 14 are rejected under 35 U.S.C. § 103 (a) as being unpatentable over Pio et.al. (U.S. Patent No. 5,894,146) in view of Peng (U.S. Patent No. 5,851,886). With regard to Claim 3, Pio teaches a memory array comprising a plurality of floating gate transistors (2) connected in series, each floating gate transistor having formed, in a well of a substrate, a source (15) region and a drain (16) region and a channel region separating said source and drain regions.

However, Pio fails to show the non-uniform concentration of dopant as claimed. Peng teaches a field effect transistor that includes a gate transistor having source and drain regions (190, 195) and channel region (170) separating the said source and drain regions and having a non-uniform concentration of dopant comprising a retrograde concentration distribution in the direction from the surface of a substrate (110) and wherein said non-uniform concentration comprises a lateral

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concentration distribution along the length of the channel that is higher in a region generally towards the central portion of the channel region and decreases toward the opposing source and drain regions. Therefore, it would have been an obvious modification to someone with ordinary skill in the art, at the time of the invention, to modify the structure as taught by Pio to include a channel region with a retrograde concentration distribution in the direction from the surface of a substrate and comprising a lateral concentration distribution along the length of the channel that is higher in a region generally towards the central portion of the channel region and decreases toward the opposing source and drain regions, as clearly suggested by Peng, in order to improve threshold voltage sensitivity in the channel region, source-drain current and hot-electron channel injection.

With regard to Claims 4 and 12, the claims contain the limitation "the non uniform concentration is formed by a tilted ion implantation utilizing as a mask a gate structure of each floating gate NMOS transistor", this is a product by process limitation. A "product by process" claim is directed to the product per se, no matter how actually made, In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessmann, 180 USPQ 324; In re Avery, 186 USPQ 161; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); In re Marosi et al, 218 USPQ 289; and particularly In re Thorpe, 227 USPQ 964, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new

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method is not patentable as a product, whether claimed in "product by process" claims or not.

Note that applicant has the burden of proof in such cases, as the above case law makes clear.

With regard to Claim 9, Pio teaches a memory array comprising a plurality of floating gate transistors (2) connected in series, each floating gate transistor having formed, in a well of a substrate, a source (15) region and a drain (16) region and a channel region separating said source and drain regions.

However, Pio fails to show the non-uniform concentration of dopant as claimed. Peng teaches a field effect transistor that includes a gate transistor having source and drain regions (190, 195) and channel region (170) separating the said source and drain regions and having a non-uniform concentration of dopant comprising a retrograde concentration distribution in the direction from the surface of a substrate (110) and wherein said non-uniform concentration comprises a lateral concentration distribution along the length of the channel that is higher in a region generally towards the central portion of the channel region and decreases toward the opposing source and drain regions. Therefore, it would have been an obvious modification to someone with ordinary skill in the art, at the time of the invention, to modify the structure as taught by Pio to include a channel region with a retrograde concentration distribution in the direction from the surface of a substrate and comprising a lateral concentration distribution along the length of the channel that is higher in a region generally towards the central portion of the channel region and decreases

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toward the opposing source and drain regions, as clearly suggested by Peng, in order to improve threshold voltage sensitivity in the channel region, source-drain current and hot-electron channel injection.

With regard to Claims 13 and 14, Applicant merely labels the claimed invention as “the transistor is an NMOS transistor” and “the NMOS transistor is a floating gate transistor”, however the claimed invention does not structurally distinguish from that taught by the prior art.

Response to Arguments

2. Applicant's arguments with respect to claims 3, 4, 9 and 12-14 have been considered, but are not deemed persuasive for the reasons stated in the body of the office action. Applicant argues regarding the 35 U.S.C. § 103 (a) rejection of Pio in view of Peng, that there is no motivation to provide a “*channel region having a non-uniform concentration of dopant*” and “*said non-uniform concentration comprises a lateral concentration distribution along the length of the channel*” for Pio because the “*lateral concentration distribution along the length of the channel*” is provided for purposes that are inapplicable to the devices of Pio. The examiner disagrees and notes that, as shown in the rejection, Peng teaches a field effect transistor that includes a gate transistor having source and drain regions (190, 195) and channel region (170) separating the said source and drain regions and having a non-uniform concentration along the length of the channel. Regarding Applicant's argument that the teachings of Peng are directed toward a different

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purpose than that of the Pio structure, the examiner notes that the non-uniform concentration of dopant taught by Peng not only can be used for the purpose of decreasing threshold voltage, but to also improve other parameters such as source-drain current and hot-electron channel injection, which would be beneficial to the structure as taught by Pio. Therefore, the claimed invention does not structurally distinguish from that taught by the combination of Pio and Peng and there is clearly a motivation to combine the references, in order to achieve the aforementioned improvements.

Applicant further argues with regard to the limitations of a “channel region having a non-uniform concentration of dopant” and “wherein said non-uniform comprises a retrograde concentration distribution in the direction from the surface of the substrate” of claims 3 and 9, that “there is nothing in Pio and Peng to disclose, teach or render obvious these limitations” and that “Indeed Pio and Peng are each completely silent as to retrograde dopant distributions. The examiner disagrees and notes that, as clearly shown above, Peng teaches a channel region (170) separating source and drain regions and having a non-uniform concentration along the length of the channel. As for the teaching of a retrograde dopant distribution, Peng clearly suggests such a distribution, since the dopant distribution is implanted by a large angle tilt implantation process over the surface of the substrate, which results in a dopant concentration distribution that is not uniform throughout the channel and is retrograde in nature.

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Lastly, Applicant argues regarding the rejection of claims 4 and 12 as product-by process claims, that “products created in conformity with the present invention are novel structures”. The examiner notes that the limitations contained in these claims do not *structurally* distinguish the claimed invention from that taught by the combination of Pio and Peng as shown above. In conclusion, the claimed invention does not structurally or patentably distinguish from that taught by the prior art and the rejection is maintained.

Conclusion

3. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

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4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Edgardo Ortiz (Art Unit 2815), whose telephone number is (703) 308-6183 or by fax at (703) 308-7722. In case the Examiner can not be reached, you might call Supervisor Eddie Lee at (703) 308-1690. Any inquiry of a general nature or relating to the status of this application should be directed to the Group 2800 receptionist whose telephone number is (703) 308-0956.

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11/8/02

A handwritten signature in black ink, appearing to read 'Eddie Lee', with a large, sweeping initial 'E'.

EDDIE LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800